Claims

1. A chemically bonded biomaterial element composed of an inorganic cement, exhibiting minimal dimensional changes upon hardening and long-time use, improved mechanical properties and improved translucency characterised in an algorithm to describe the micro-structure, which is expressed as

$$\lambda = \frac{d * (1 - V_F)}{(V_F)}$$

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where λ is the distance between filler particles of mean size d, and V_F is the volume content of non-reacted cement and added filler, and where $\lambda=10~\mu m$.

- 2. A biomaterial element according to claim 1, characterised in that $\lambda = 8 \mu m$, even more preferred $\lambda = 4 \mu m$ and most preferred $\lambda = 2 \mu m$.
 - 3. A biomaterial element according to claim 1 or 2, characterised in that V_F is less than 50 %, preferably 5-45 % and even more preferred 15-35 %.
- 4. A biomaterial element according to any one of the preceding claims, characterised in that it exerts a pressure or tensile force of < 5 MPa, even more preferred < 2 MPa and even more preferred < 1 MPa, on a surrounding volume.
- 5. A biomaterial element according to any one of the preceding claims,
 25 characterised in that the inorganic phase is composed of Ca-aluminate and/or Ca-silicate and/or Ca-phosphate.
- 6. A biomaterial element according to any one of the preceding claims, characterised in that the inorganic phase is composed of phases in the CaO-Al₂O₃
 30 system, i.e. CaO, (CaO)₃Al₂O₃, (CaO)₁₂(Al₂O₃)₇, CaOAl₂O₃, (CaO)(Al₂O₃)₂, (CaO)(Al₂O₃)₆ and/or pure Al₂O₃ with varying relative contents, where the preferred main phases are CaOAl₂O₃ and (CaO)(Al₂O₃)₂ and the most preferred main phase is CaOAl₂O₃, a particle size of formed hydrates of these phases being below 3 μm, even more preferred below 1 μm and most preferred below 0.5 μm.

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- 7. A biomaterial element according to any one of the preceding claims, characterised in that it also comprises an organic phase of preferably polyacrylates and/or polycarbonates and preferably at a volume content of < 5 %.
- 5 8. A biomaterial element according to any one of the preceding claims, characterised in that added inert filler particles have a particle size below 5 µm, even more preferred below 2 um.
- 9. A biomaterial element according to claim 8, characterised in that added filler 10 particles consist of glass particles, apatites, brucite and/or böhmite.
 - 10. A biomaterial element according to any one of the preceding claims, characterised in that it comprises in-situ formed apatite or some other phase that separates the formed hydrates of the main system.

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11. A biomaterial element according to any one of the preceding claims, characterised in that a total porosity is below 10 %, even more preferred below 5 %, distributed on minipores having a diameter below 0.5 μm, even more preferred below 0.1 µm, to an extent of at least 90 % of the total porosity.

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- 12. A biomaterial element according to any one of the preceding claims. characterised in that it is a dental material, preferably a dental filling material or a root filling material.
- 25 13. A biomaterial element according to any one of the preceding claims, characterised in that it is an orthopaedic material or a bone cement.
 - 14. A biomaterial element according to any one of the preceding claims, characterised in that it is a component or is in granule form, preferably as a carrier material for drug delivery.
 - 15. A device in connection with the preparation of a chemically bonded biomaterial element according to any one of the preceding claims, from a powdered material comprising a binder phase and a liquid reacting with the binder phase,
- characterised in that said device comprises a first container (5) that contains the 35 powdered material, and a second container (3) that contains said liquid reacting with the binder phase, and an openable closure (3) between the containers (5, 3).